Operating on Matrices

OperateMatrices.tns

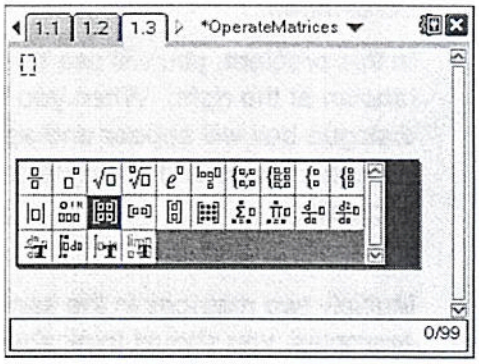
Name _____

Class _____

Open up a new TI-Nspire document. Insert a new *Calculator* page or open the *Scratchpad* (📝 or press ctrl 0) to start this activity.

Part 1 – Adding and Subtracting Matrices

Matrices are located in the Math Template, which can be accessed through the catalog (📖) or by pressing (math). The template is pictured at the right.



The highlighted template is for a 2 × 2 matrix. Select this template by pressing (enter).

Fill in the values by typing the number and using either (tab) or the NavPad to move between the entries in each row or column.

1. Enter the following examples. Record the results for each exercise.

a. $\begin{bmatrix}2 & 5\\8 & -11\end{bmatrix}+\begin{bmatrix}1 & 0\\-3 & 7\end{bmatrix}=\begin{bmatrix}3 & 5\\5 & -4\end{bmatrix}$

$2\times 2 = 2\times 2$ ✓

b. $\begin{bmatrix}2 & 3\\10 & -1\end{bmatrix}-\begin{bmatrix}4 & 9\\-5 & 2\end{bmatrix}=\begin{bmatrix}-2 & -6\\15 & -3\end{bmatrix}$

$2\times 2 = 2\times 2$ ✓

c. $\begin{bmatrix}4\\9\end{bmatrix}+\begin{bmatrix}1 & -6\\-2 & 8\end{bmatrix}$ ∴ cannot be done

$2\times 1 \neq 2\times 2$

d. $\begin{bmatrix}7 & -9\\-3 & 4\end{bmatrix}-\begin{bmatrix}6 & -5 & 0\\-1 & 0 & 3\end{bmatrix}$ ∴ cannot be done

$2\times 2 \neq 2\times 3$

2. When can matrices be added or subtracted?

When dimensions (order) are equal

3. How does the error message help figure out the rule to add and subtract matrices?

There has to be the same amount of rows + columns in both matrices.

4. What is the rule to add and subtract matrices?

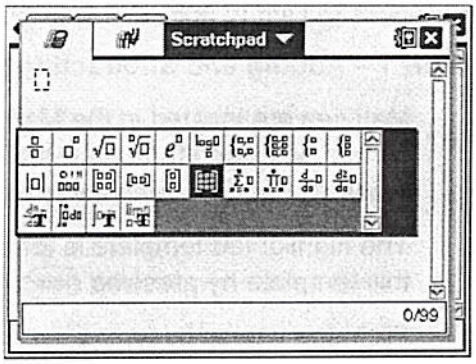
Add/subtract the corresponding elements

* a_{11} w/ a_{11}, a_{12} w/ a_{12}, etc...

Part 2 – Multiplying Matrices

Insert a new *Calculator* page by pressing ctrl + I and selecting **Calculator** or press ⌨ to open the *Scratchpad*.

In this problem, you will use the 3 × 3 matrix template (shown at the right). When you select this template, a dialogue box will appear and ask you to enter the number of rows and columns of the matrix you want to create.



Multiply two matrices in the same manner as adding or subtracting. As you complete the examples, you should think about the dimensions of the two matrices multiplied together and the answer.

5. Calculate the following examples. Record the results for each exercise.

a. $\begin{bmatrix} 4 & -3 \\ -1 & 7 \end{bmatrix} \cdot \begin{bmatrix} 1 & 3 \\ 8 & 5 \end{bmatrix} = \begin{bmatrix} -20 & -3 \\ 55 & 32 \end{bmatrix}$

$(2 \times \boxed{2})(\boxed{2} \times 2) = 2 \times 2$ (equal)

b. $[1 \quad 9] \cdot \begin{bmatrix} -1 \\ -4 \end{bmatrix} = [-37]$

$(1 \times \boxed{2})(\boxed{2} \times 1) = 1 \times 1$ (equal)

c. $\begin{bmatrix} 2 \\ 7 \end{bmatrix} \cdot [-3 \quad 5] = \begin{bmatrix} -6 & 10 \\ -21 & 35 \end{bmatrix}$

$(2 \times \boxed{1})(\boxed{1} \times 2) = 2 \times 2$ (equal)

d. $\begin{bmatrix} 2 & 5 & 7 \\ -4 & 11 & -8 \\ -6 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & 6 & 10 \\ 0 & -1 & 1 \\ 7 & 1 & 5 \end{bmatrix} = \begin{bmatrix} 55 & 14 & 60 \\ -68 & -43 & -69 \\ -11 & -35 & -55 \end{bmatrix}$

$(3 \times \boxed{3})(\boxed{3} \times 3) = 3 \times 3$ (equal)

e. $\begin{bmatrix} -2 & 0 \\ 8 & 4 \end{bmatrix} \cdot \begin{bmatrix} 3 \\ 5 \\ 9 \end{bmatrix}$ ∴ cannot be done

$(2 \times \boxed{2})(\boxed{3} \times 1)$ (not equal)

6. What dimension matrices could be multiplied?

When # columns in 1ST matrix equals # rows in 2nd matrix

7. If the matrices could be multiplied, what is the dimension of the result?

rows of 1ST matrix × # columns of 2nd matrix

8. If an $a \times b$ matrix is multiplied by a $c \times d$ matrix, what must be true in order to get an answer?

$(a \times b)(c \times d)$

need $b = c$

result : $a \times d$